PATENT SPECIFICATION

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741,455

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COMPLETE SPECIFICATION

Improvements in or relating to Reciprocating Pumps and Motors

I, LESLIE PEEL, a British Subject of 48 Wolfreton Lane, in the Parish of Willerby, in the East Riding of the County of York, do hereby declare the invention, for which I pray that a Patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to reciprocating pumps and motors of the kind having a reciprocating and rotating piston.

The present invention consists in a pump of this kind wherein the open ends of a pair of co-axially mounted opposed cylinders, in which a common or double-ended piston works, are oblique and their edges are complementarily shaped and spaced apart to define between them a continuous cam slot through which a peg or pin, rigid with the piston, projects to engage slidably an axial groove or keyway in a drive-transmission member rotably mounted around the cylinders, the shape of the cam slot being such that upon rotation of the drive-transmission member the piston is reciprocated or, for a motor, upon reciprocation of the piston the drive-transmission member is rotated and wherein an axial groove or recess in the piston open to an associated working space in each cylinder co-operates upon rotation of the piston in turn with inlet and outlet ports in a part of the bore of one or each cylinder not uncovered by the piston during its stroke.

The inlet and outlet ports are so arranged in relation to the axial groove that the ports are opened and closed at the correct time in the pump or engine cycle. The piston has an axial groove associated with each working space. Both grooves may co-operate with one set of inlet and outlet ports but it is preferred that each groove should co-operate with a separate set of ports.

The or each groove may be opened to its associated working space by passages formed by drillings or pipes within the piston, but with two sets of ports each axial groove or recess may conveniently be extended to the adjacent piston end to open the groove to its associated working space.

So that the invention may be more clearly understood an embodiment will now be described with reference to the accompanying diagrammatic drawings in which:

Figure 1 is a sectional elevator of a pump in accordance with the invention.

Figure 2 is a sectional end elevation on line 2—2 of Figure 1.

Figure 3 is a sectional elevation on line 3—3 of Figure 1.

Figure 4 is a perspective view of the pump piston.

Two cylinders 5 each closed at one end are mounted co-axially with their open ends confronting in mounting blocks 11. A common piston 6 works in both cylinders forming a working space between the end of each cylinder and the adjacent end of the piston. The confronting open ends of the cylinders 5 are oblique and their end edges are complementarily shaped and spaced apart to define between them a continuous oblique cam slot 7 through which a peg or pin 8 rigid with the piston 6 extends and projects beyond the cylinder wall into and for sliding engagement with an axial groove or keyway 9 in the bore of a Vee-belt pulley 10 rotably mounted around the cylinders 5. The cylinders extend symmetrically to each side of the pulley 10 axial movement of which on the cylinders is prevented by thrust washers 12 interposed between each face of the pulley and the adjacent mounting block. Part-annular cavities within the mounting blocks form inlet manifolds 13 and outlet manifolds 14. Apertures in and circumferentially spaced around the cylinder walls open the inlet and outlet manifolds to the bores of the cylinders 5 and form inlet ports 15 and outlet ports 16 respectively. The set of ports at each end of the cylinder is arranged at a part of the cylinder bore which is not uncovered by the piston 6 during its working stroke. With each set of inlet and

outlet ports 15, 16 co-operates an axial groove or recess 17 in the piston which extends axially through the adjacent piston end to open the groove to the working space with which the groove is associated. Each groove has a length slightly greater than the piston stroke and a width sufficient to bridge the divisions 18 between the inlet ports 15 or outlet ports 16 but narrower than the division 19 between the ends of the series of inlet ports 15 and outlet ports 16.

The pump operates as follows. Upon rotation of the pulley 10 the piston 6 is rotated in the same direction by the peg or pin 8 and is sumultaneously reciprocated by the engagement of the pin 8 with the oblique cam slot 7. The necessary relative movement between the pin 8 and pulley 10 is permitted by the keyway or groove 9. As the piston 6 rotates, the grooves 17 are opened in turn to the inlet and outlet ports 15 and 16 The designation of the ports in the drawings assumes a clockwise direction of rotation when the pump is viewed from the end shown in Figure 2. Each groove 17 is then open to the inlet ports 15 while the associated working space is increasing in volume and to the outlet ports 16 while that volume is decreasing. If the direction of rotation is reversed the inlet and outlet ports become interchanged. As shown in Figure 4 of the drawings the grooves 17 are axially aligned; the inlet and outlet manifold of one set of ports are therefore arranged on the opposite sides of the piston to the respective manifold of the other set.

Instead of having two sets of ports as shown in the drawings a single set may be used. An axial drilling through the piston may connect the working space remote from the ports to a groove 17 diametrically opposite the groove associated with the nearer working space.

In the drawing the axis of the slot 7 lies in a plane oblique to the axis of the piston but may have any other suitable contour, for example, it may be shaped to increase or reduce the piston speed over part of its stroke.

The machine may be used as a compressed air motor or steam engine provided that the angle of inclination of the slot is not so small that the mechanism is irreversible, that is to say, that the piston can be reciprocated to rotate the pulley.

Instead of the pulley 10 some other form of driving transmission member may be employed for example chain sprocket or toothed gear and for a motor the drive transmission member may act as, or be combined with, a flywheel.

Instead of all the inlet or outlet ports of a series being joined by a common manifold, the individual ports may be connected singly or in groups by suitably partitioning the manifolds or otherwise to different sources or delivery points. For example, inlet ports connected to different sources may be used to mix several liquids or gases in pre-determined proportions. As another example, the pump according to the invention may be gear driven and sectional outlet ports connected to various delivery points to give timed deliveries under pressure to each. Such applications occur in internal combustion engines running on fuel injection cycles and for multi-point lubricators. If sectional inlet or outlet ports are not needed for such special purposes each port may be formed by a single elongated opening.

What I claim is:—

1. A reciprocating pump or motor wherein the open ends of a pair of co-axially mounted opposed cylinders, in which a common or double-ended piston works, are oblique and their edges are complementarily shaped and spaced apart to define between them a continuous cam slot through which a peg or pin, rigid with the piston, projects to engage slidably an axial groove or keyway in a drive-transmission member rotably mounted around the cylinders, the shape of the cam slot being such that upon rotation of the drive-transmission member the piston is reciprocated or, for a motor, upon reciprocation of the piston the drive transmission member is rotated and wherein an axial groove or recess in the piston open to an associated working space in each cylinder co-operates upon rotation of the piston in turn with inlet and outlet ports in a part of the bore of one or each cylinder not uncovered by the piston during its stroke.

2. A reciprocating pump or motor according to claim 1 wherein the grooves associated with each working space co-operate with a separate set of ports in each cylinder.

3. A reciprocating pump or motor according to Claim 1 or 2 wherein the or each axial groove itself extends through the piston end to be open to the associated working space.

4. A reciprocating pump or motor according to any preceding claim wherein ports circumferentially spaced around the wall of one or each cylinder are interconnected by a manifold around the cylinder to form a series of inlet or outlet ports.

5. A reciprocating pump or motor according to any of Claims 1 to 3 wherein inlet or outlet ports circumferentially spaced around the wall of one or each cylinder are adapted to be connected singly or in groups to different sources or delivery points.

6. A reciprocating pump or motor substantially as herein described with reference to and as illustrated by the accompanying drawings.

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PROVISIONAL SPECIFICATION

Improvements in or relating to Reciprocating Pumps and Motors

I, LESLIE PEEL, of 48 Wolfreton Lane, in the Parish of Willerby, in the East Riding of the County of York, a British Subject, do hereby declare this invention to be described in the following statement:—

This invention relates to a method of and means for utilising the piston of a piston pump or piston engine as a rotary valve in addition to its normal function, thus obviating the need for separate valve mechanisms in such pumps and engines. This is accomplished by causing the piston to rotate on its axis whilst reciprocating, the perimeter of the piston having on its surface a recess, which registers with ports in the cylinder wall to provide ingress and egress of the gases or liquids at the correct times in the cycle of operations of the pump or engine. In a particular embodiment of this invention the pump consists of two identical cylinders, each closed at one end, and with narrow inlet and outlet ports positioned on opposing walls, each at the same depth from the cylinder head and each extending almost half way round the cylinder, the ports being divided into sections if and as required. The open end of each cylinder is cut diagonally across to form a cam. The two cylinders are rigidly fixed in line in opposition to each other, leaving a diagonal slot in the centre of the assembly.

One double-ended piston serves the two cylinders. This piston is of round section, its length being equal to the overall internal length of the two cylinders when mounted, less rather more than the piston stroke. It is a good sliding fit in the cylinders. At each end, and on opposite sides, a recess is cut down the piston wall to a depth of rather more than the piston stroke. Each recess is in the form of a slot, sufficiently narrow to give adequate cut-off between inlet and outlet ports. These recesses register with the inlet and outlet ports of the respective cylinders as the piston rotates and reciprocates, opening and closing the respective ports.

The reciprocatory and rotatory movements of the piston are jointly controlled by a pin protruding from the centre of the piston at right angles to its axis. This pin fits into the diagonal slot between the two cylinders and protrudes a short distance beyond the outer circumference of the cylinders to fit loosely into a slot in the driving wheel. This Driving Wheel rotates freely on the outer circumference of the cylinders, and has a slot cut along the length of its bore in which the protruding piston pin slides freely. End to end motion of the driving wheel is prevented by thrust bearings, formed by the inner ends of the cylinder mountings.

The action of the pump is as follows:—

When the driving wheel is revolved, it rotates the piston by means of the pin protruding from the centre of the piston, and fitting into the slot in the driving wheel bore. As the pin is revolved, it bears on the diagonal surfaces of the cylinder ends, causing the piston to move up and down in the cylinders, the pin meanwhile moving from end to end in the slot in the driving wheel.

In one cylinder the piston begins to descend, the recess in its end meanwhile revolving to uncover the inlet port. In the opposite cylinder the piston begins to ascend, and revolves to uncover the outlet port in similar fashion, each revolution of the driving wheel completing a cycle of operations in both cylinders.

Manifolds are fitted over each inlet and outlet port and connections made thereto as required. (These manifolds in the design here described also form the cylinder mountings and thrust bearings of the driving wheel.)

Although the above form of device and its application is preferred, the construction and use may be modified without departing from the scope of the invention.

L. PEEL.

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741,455 COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

FIG. 1.

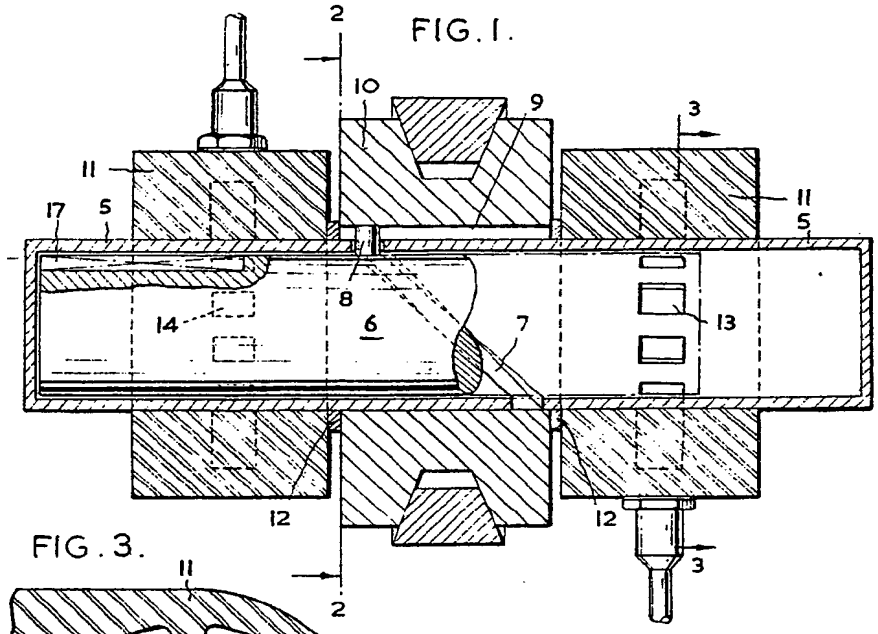


FIG. 3.

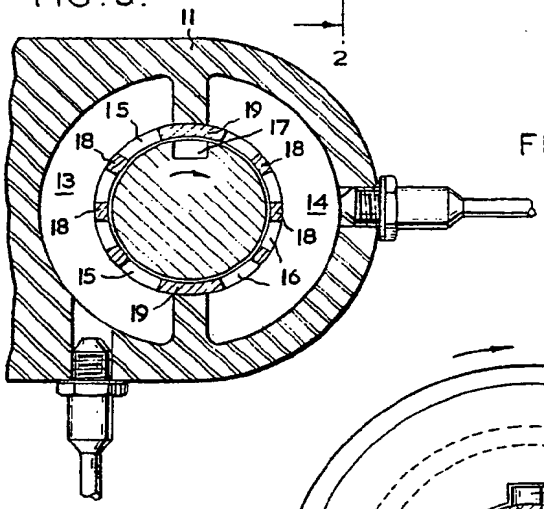


FIG. 4.

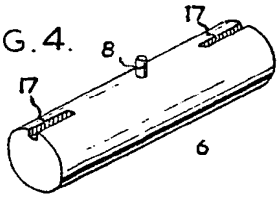
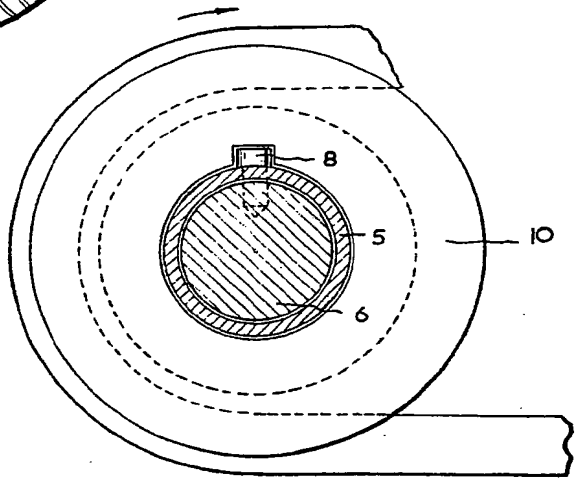


FIG. 2.



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